AN991
APPLICATION NOTE

L6569 - L6561 LIGHTING APPLICATION WITH PFC

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DESCRIPTION

The application has been developed to supply two 18W fluorescent lamps. It consists of two sections: a Power Factor Corrected preregulator (PFC), using the L6561, and the lamp ballast stage with the L6569 (see fig.1).

The power factor corrector section is based on the L6561. This is an IC intended to control PFC preregulators by using the transition mode technique. It is especially dedicated for electronic lamp ballast applications (to better understand the L6561 characteristics refer to AN966).

Referring to the application circuit (see fig.1), the AC mains voltage is rectified by a diodes bridge and delivered to the boost converter. The converter section boosts the rectified voltage to a DC controlled value. The section consists of a boost inductor (T_1), a controlled power switch (Q_1), a boost diode (D_1), an output capacitor (C_5) and, obviously, a control circuitry.

Since the input is a time-variable supply voltage (sine wave), to make the input current shaped like the line voltage, the converter has to produce a boost inductor average current like the rectified input voltage. To do so, the L6561 controls the system in transition mode. Transition mode approach consists of a "zero current turn-on" system, switching at variable frequency and duty cycle. The output voltage value of the PFC, which can be adjusted by the pair of resistor R_7-R_8, is set at 400 Volt.

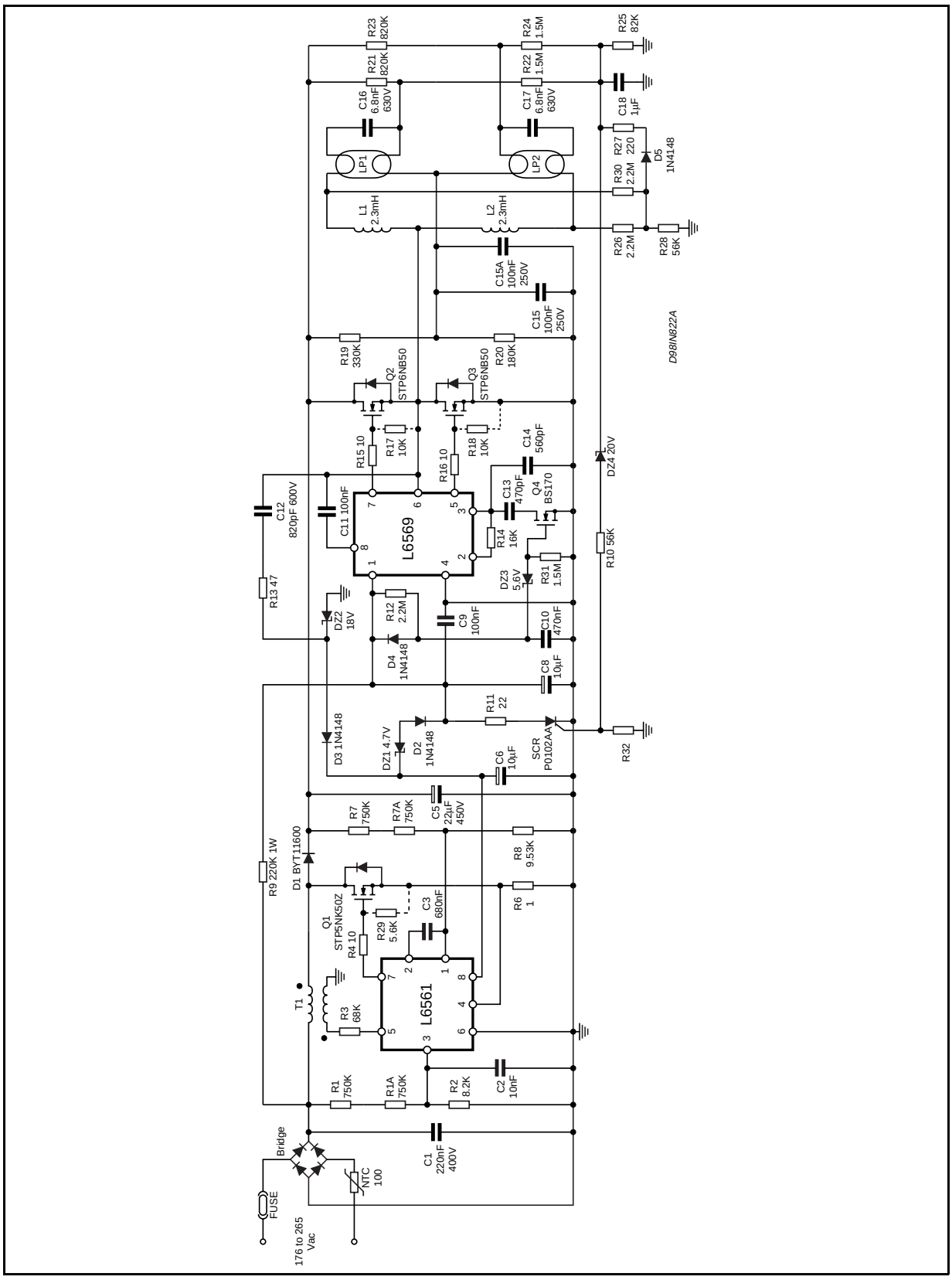
The regulated voltage is delivered to the ballast section. The L6569 is a high voltage half-bridge driver with a built-in oscillator, similar to a NE555 timer (to better understand the L6569 in lighting applications refer to AN880). The load consists of a L-C series resonant circuit with the lamps connected across the capacitors. This topology allows to operate in Zero Voltage Switching, to reduce the transistor switching losses and the electromagnetic interference generated by the output wiring of the lamp.

The preheating of the lamp cathodes is achieved by a high switching frequency, about 80 kHz (R_{14}, C_{14}), as current flows in the filaments, without lamp ignition. The preheating time is defined by the time constant R_{12} C_{10}. After this time has elapsed, the switching frequency decreases moving towards the resonance one (L_1/L_2, C_{16}/C_{17}), thus increasing the voltage across the lamps and causing the ignition. In steady state the frequency reaches 44 kHz (R_{14}, C_{13}+C_{14}).

At start up, when the PFC is not running, the ballast controller (L6569) is powered by R_9. When the ballast section is running, the current pump (C_{12}, R_{13}, D_3 and D_{Z2}) allows to start up the power factor section and supply the overall circuit. This sequence prevents the activation of the PFC over voltage protection. In fact if the PFC starts first, it is not loaded as long as the ballast is not operating.

The application is provided with a safety circuitry that, in case of open load or ignition failure, shuts down the supply of the two controllers. This fault condition is latched by the SCR until the mains is removed and the turn-on sequence is repeated.

Figure 1. Schematic circuit



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